OOOOa Fugitive Emissions

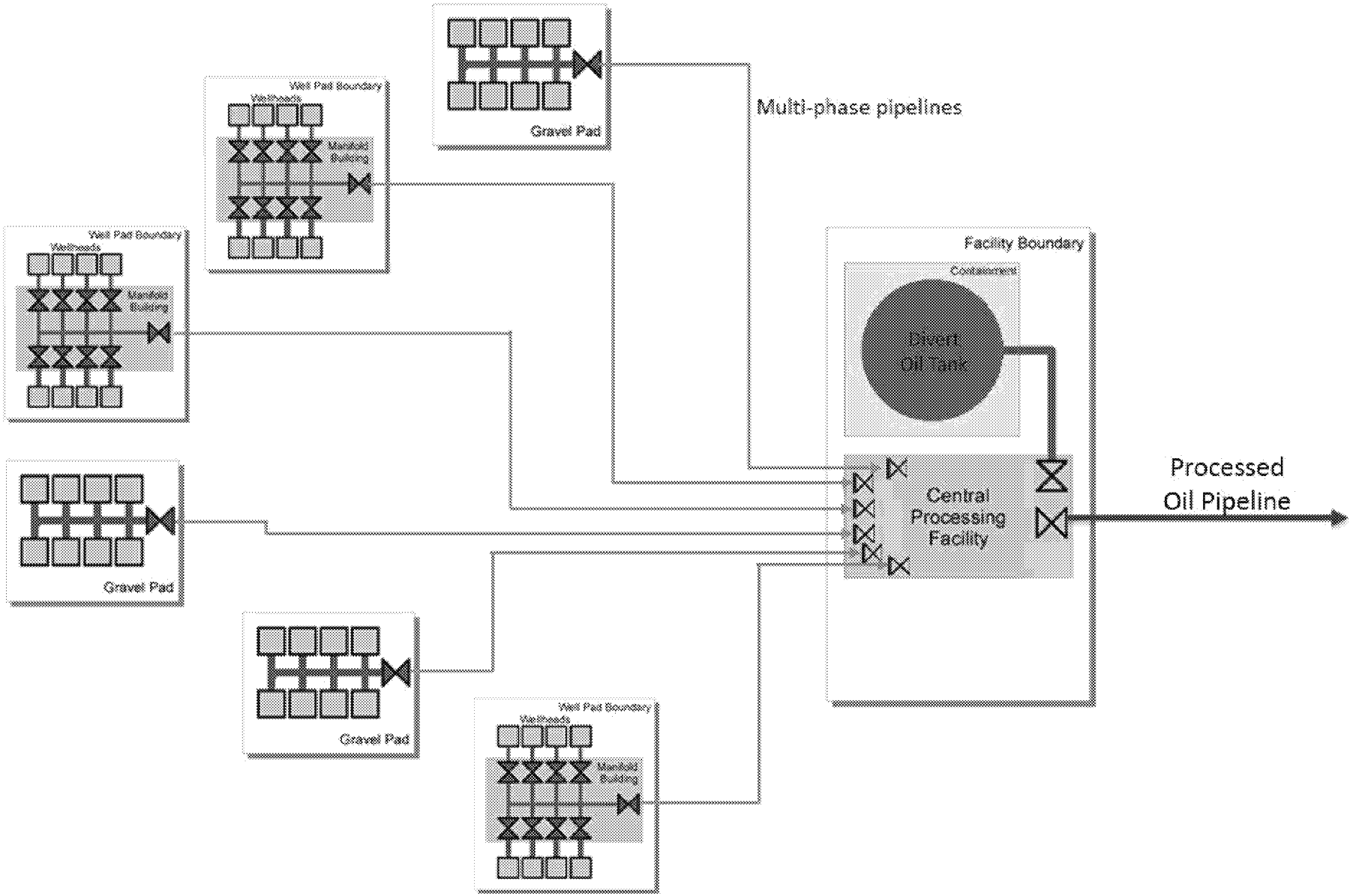
August 31, 2016

CPAI and EPA Meeting

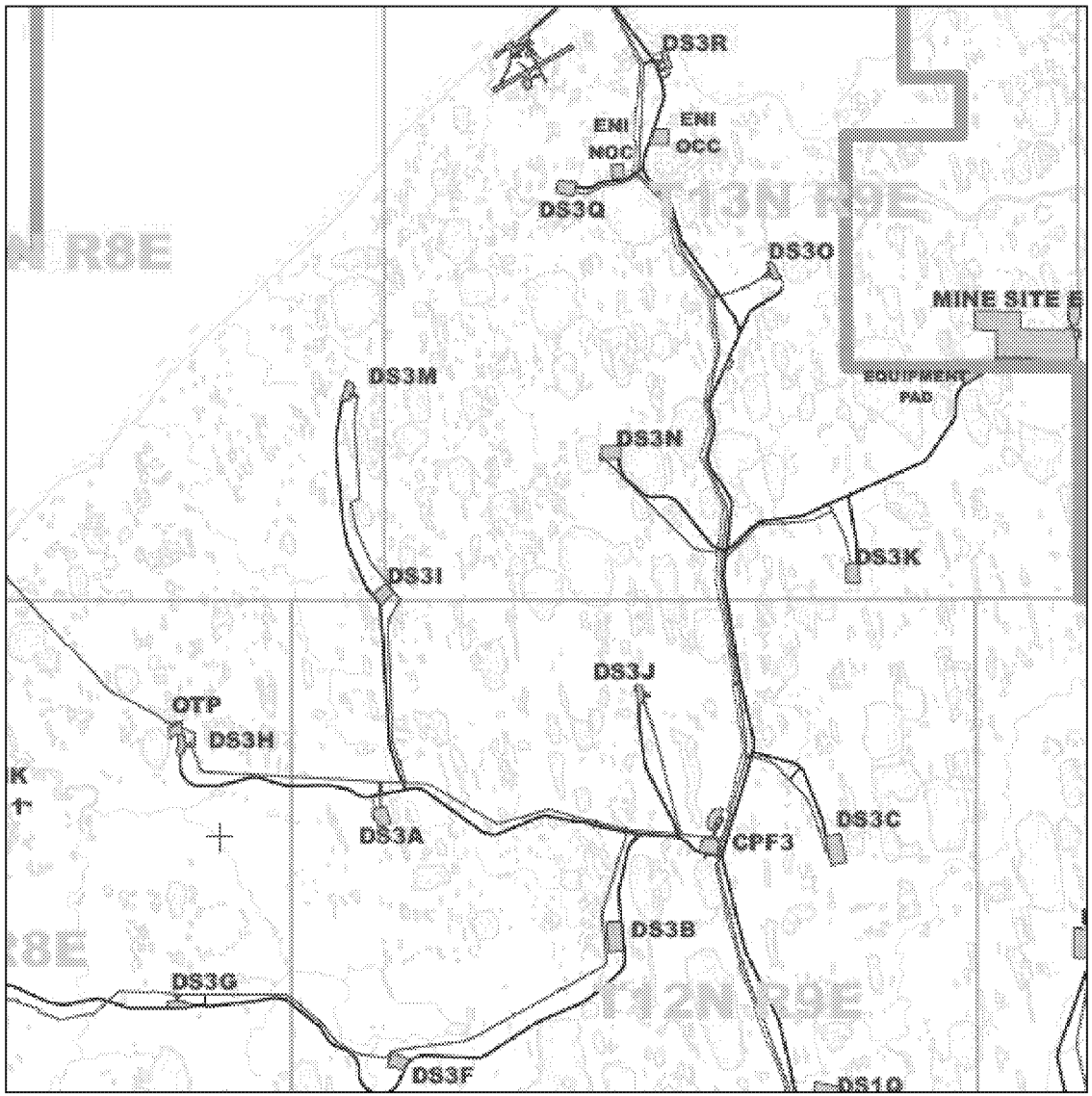
Agenda

- North Slope Operations Overview
- Arctic Concerns
  - Initial Survey Times
  - Repair timelines
  - Wellsite/Compressor station Definitions
- Process Unit
  - North Slope exemption unclear
- Path Forward

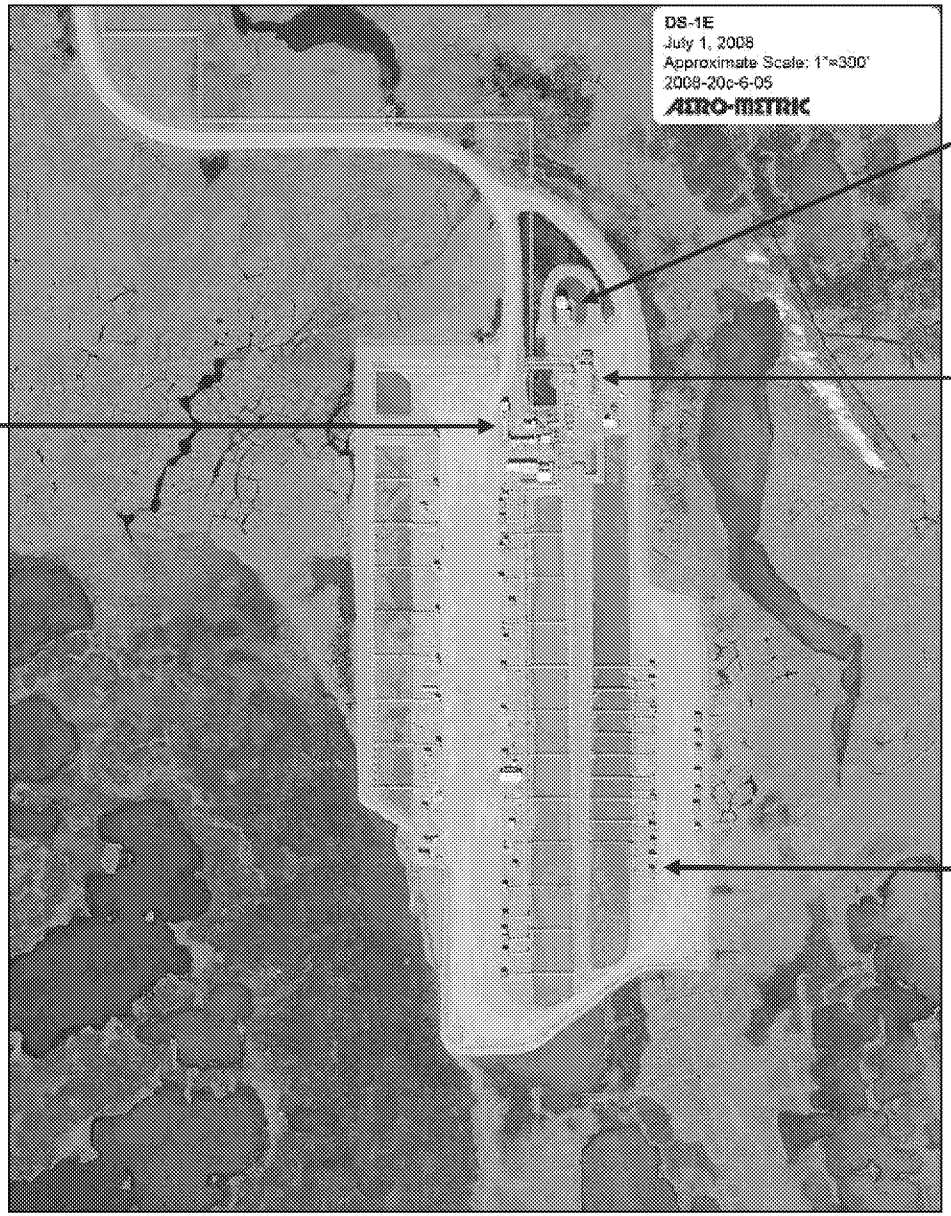
North Slope Operational Overview



Central Processing Facility 3 (CPF3)



Typical Drill Site



Methanol Tank for Freeze Protect

Manifold Building

Line Heater

Wellhead inside a wellhouse

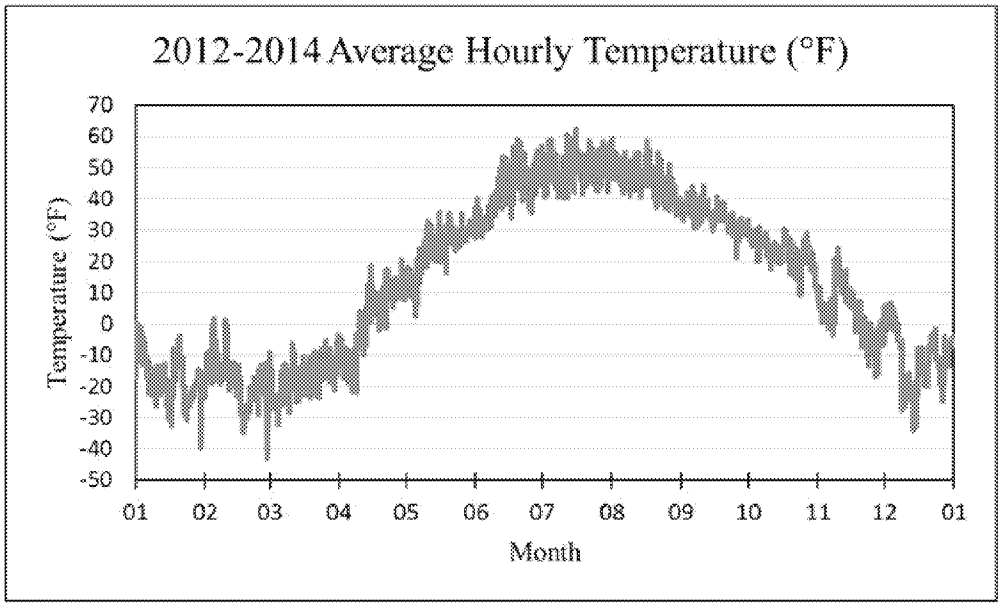
Typical Processing Facility

Unique to North Slope Operations

- Processing facilities are enclosed
- Processing facilities and manifold buildings equipped with gas detection systems and alarms
- Processing facilities are manned 24-7-365
- Drill sites are visited daily (weather dependent) and have multiple wells
- Economics
  - Wellsite
    - Model Plant: $2,285 (annual cost for semi-annual survey, no cost recovery)
    - NS average estimate: $4,976
  - Compressor Station:
    - Model Plant: $25,049 (annual cost for 4 surveys, no cost recovery)
    - NS estimate: $216,000 (annual cost for 3 surveys)
  - No gas sales, no economic recovery

Arctic Concerns – Initial Survey Times

- Temperature
  - Average temperatures are below 0F for approximately 5 months
  - RTC for compressor stations acknowledged limitations of technology
    - Doubt of any place with sustained low temperatures for 6 months straight
  - 60 initial survey
    - Impossible during winter months
  - 5 months of below 0 temperatures makes semi-annual surveys (and repairs) nearly impossible, if everything goes smoothly.
    - 1 survey (May)
      - Repairs (June)
      - Resurvey (July)
    - 2 Survey (September – 4 months)
      - Repairs (October)
      - Resurvey (November)
        - Temperatures issues



Arctic Concerns – Repair Timelines

- Fix within 30 days unless technically infeasible then "during next compressor station shutdown, well shutdown, well shut-in, after an *unscheduled*, planned, or *emergency* vent blowdown or within 2 years, whichever is earlier."
  - Language was not able to be commented on during PC period
  - If unscheduled or emergency vent blow downs occur during the winter time, focus is to get everything running ASAP to avoid freeze up and mitigate possible process safety danger
- North Slope Challenges:
  - The acquisition of spare parts can be challenging
    - Specialty parts (rated -50F) can have long ordering lead times (up to 36 months)
    - Stock on-hand
    - Not near any population center

Arctic Concerns – Wellsite/Compressor Station Definitions

- Some wells are co-located with a production facility
- Current definitions the production facility would be considered a well site
  - Semi-annual survey
  - Compressors exempt from Centrifugal and Reciprocating compressor standards of OOOOa.
- If separation can occur
  - Wells would be semi annual surveys
  - Facility
    - Subject to compressor station modifications – Quarterly surveys once triggered
    - Compressors would be subject to centrifugal and reciprocating compressor standards of OOOOa.

Process Units

- North Slope exemption is unclear
  - 60.5401a(e)
  - Initial vs. routine monitoring exemption for North Slope

Path Forward

- Want to work with the EPA to define a North Slope specific LDAR program
  - LDAR program that will work for both EPA and North Slope Operators
    - Technological challenges
    - Weather challenges
    - Logistical challenges